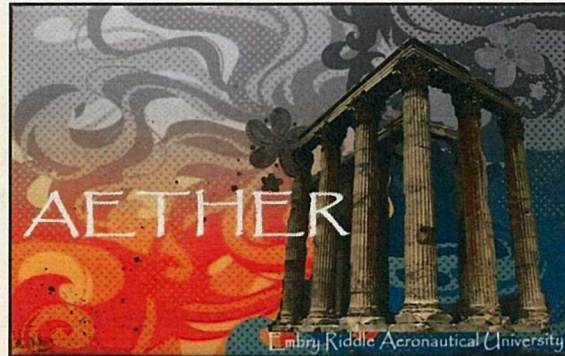


REACHING OUT

Team AETHER



Team Members

Amanda Pollock

Andrew Armas

Chris Colvin

Jerosh Jaison

Kelsey Justis

Laura Serio

Michaela Ryle

Nadir Bagaveyev

Nicholas Riggs

Randy Breingan

Rayna Thompson

Ronnie Sliwicki

Tiffany Musholt

Yi Zhang

EMBRY RIDDLE AERONAUTICAL UNIVERSITY

DAYTONA BEACH CAMPUS



Faculty Advisors

Caroline Liron

Charles Reinholtz

Embry Riddle Aeronautical University's Daytona Beach Campus Lunabotics Team took the opportunity to share the love of space, engineering and technology through the educational outreach portion of the competition. Through visits to elementary schools and high schools, and through support of science fairs and robotics competitions, younger generations were introduced to space, engineering and robotics. This report documents the outreach activities of team Aether.

Outreaching to Elementary Schools

Team Aether encouraged many elementary schools to open their doors to discover engineering. Robert Miller, from Port Orange Elementary School, quickly responded and volunteered his gifted twenty-five 5th graders to step up to the challenges of learning about robotics, engineering and lunar activities.

Robotics is everywhere in daily life. The Roomba®, a self-guided vacuum cleaner, is a common device that is familiar to most 5th graders. Automatically articulated toys, such as cars and talking robots, immediately draw the attention of the boys. Taking apart the articulated robot briefly demonstrated the complexity of wiring in robotics, and the overall idea of designing such toys was introduced. In a further effort to educate the students on the club's initiative to compete in the NASA Lunabotics mining competition, the most challenging portion of the competition was brought to their classroom: the initial conceptual design of the robot.



Articulated robot and jars of regolith and sand help introduce the Lunabotic event

Mr. Robert's class proudly shared their previous knowledge on the major differences between the environment of the Earth and the moon. The Lunabotics team finally introduced the key ingredient – the regolith – with an explanation about why NASA was interested in modifying the lunar surface. Each student had the opportunity to feel the density and texture of the regolith, as well as discover the 'dust' effect compared to regular sand by sliding a ruler into a jar of regolith and a jar of sand.

After talking about the differences between the environments on the Earth and the moon, the Lunabotics team members proceeded to highlight the different methods possible to collect regolith. The team members defended the current scoop-design that would be used in the upcoming competition while clearly stating the major challenges yet to be overcome. Changes that would help increase the efficiency of the mechanism were also discussed.



The design of the aluminum scoop was discussed

After a general question and answer session, five small teams of elementary school students eagerly started designing their own Lunabotics robot, including a collecting mechanism for the regolith. After each of the five teams decided on a team name, each student developed their own design.



Each student developed their own design, then combined ideas

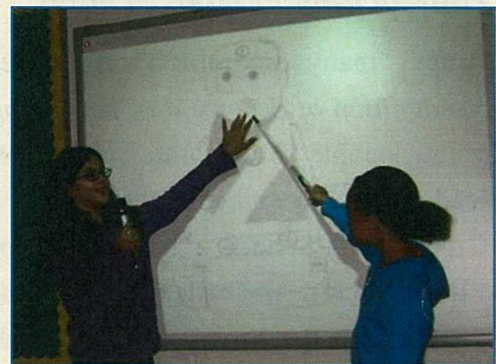


Team member Jerosh Jaion explains how wheels on tanks work

The students spent the next 45 minutes brainstorming, collaborating, discussing, and implementing their designs. With the assistance of an Aether team member facilitating each group, students began sharing their ideas amongst the group. To clearly encourage team-work, only one design per team was to be presented.

The student's designs were much better developed than we expected. All of the teams were unyielding in their use of solar cells to power their vehicles and in the use of "extra" batteries as a contingency in case the rover was to drive on to the 'Dark side of the Moon'. Most of the designs also used "tank drive" to avoid getting stuck in craters. Each team also made sure there was plenty of clearance between the platform of the robot and the surface of the moon to better traverse obstacles. The point of engineering where all the designs differed was on how the regolith was collected and transported from one point to another. These differences in approach led to robots that went on to look like the "Iron Man" or a centipede.

Upon completion, each team was given five minutes to present their design. An immediate Q&A session from their peers regarding their system gave way to further discussion. Some very insightful discussions had to be cut short to stay within the allotted time.



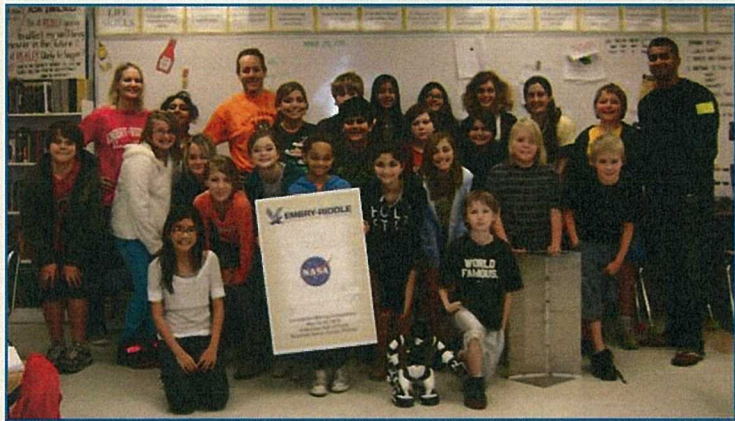
The winning team explains the positions of cameras and other sensors on the head

Team Aether's members chose a winner based on the plausibility of the system, the feasibility of building such a system, and the efficiency of the mechanism. The design used a digger/scooper system around a central axis which allowed the robot to rotate freely 360 degrees around its waist, thus requiring very little movement at the base. This minimized the generation of dust from track movement.

The team stayed afterwards to answer more individual question from students. This outreach experience with the students at Port Orange Elementary School exceeded our expectations, even more so when Mr. Miller encouraged the students to develop their robot using a CAD software package called Google SketchUp© during their spring break! The student's excitement and energy was contagious. We succeeded in our goal to engage and retain each student's interest in lunar science, technology, engineering, and mathematics.

As a continuation of this outreach program, Mr. Robert Miller's class at Port Orange Elementary is expected to travel to Embry Riddle's Robotics lab before the end of the semester. Team Aether's members are eager to give them a hands-on tour of the Robotics lab.

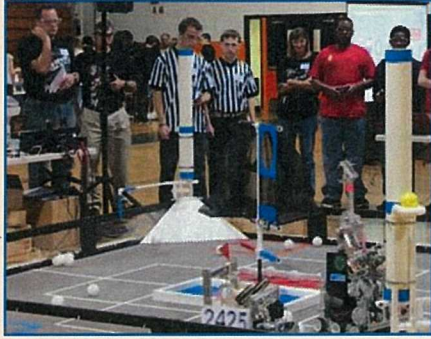
(Refer to Appendix A, page 6, for additional documents on Port Orange Elementary Outreach Day, as well as screenshots of the student's CAD drawings)



The class really enjoyed working with the Lunabotic team and pursued the project through SketchUp

Outreaching to High Schools

Among many programs aimed at reaching out to high schools, FIRST, *For Inspiration and Recognition of Science and Technology*, is known to reach over 210,000 students. It encourages young people to celebrate science and technology, as well as cultivate a dream of becoming leaders. In December 2009, Embry Riddle in conjunction with a local high school – Spruce Creek High School – hosted the local Robofest competition which grouped two programs: FIRST Technical Challenge (FTC) and FIRST Lego League Competition. In February 2010, five members of the Embry Riddle Lunabotics team traveled to the University of South Florida in Tampa to host the FTC State Championships. The FIRST Technical Challenge is a unique competition designed to get high school students interested in math, science, engineering, and technology.



Referees oversee the ethic aspect of the teams, and reinforce rules during games

This year the competition involved teams playing “hot shot”. A match involved two alliances, made up of four teams, competing to see who would score the highest number of high, low, and far goals by collecting and shooting wiffle balls during an autonomous and remote control period. Lunabotics team members assisted as referees and with the flow of the competition by preparing the teams before each match, checking robot specifications, investigating and judging team ethics, and evaluating engineering notebooks.

One team member, Laura Serio, mentored a FIRST Robotics Competition team for 6 weeks, helping with mechanical design, mathematical applications in their designs, as well as promoting a good team ethic while working and competing.

The high school students who participated in the competition had a rewarding and enjoyable experience. FIRST is a great way to get students involved in an engineering and technology related competition, as well as a way to get students to think about pursuing these fields in the future. At that age, they are looking at colleges and trying to decide on a major. Some expressed high interest in attending Embry Riddle University, and asked for tours. Therefore team Aether’s immediate contact with the teams helped make the competition a positive experience for the students as well as a time to answer any questions they had. Having a positive experience at a robotics competition will influence high school students to consider majoring in engineering and technology.

(Refer to Appendix B, page 9, for additional pictures on Spruce Creek High School FIRST Days)

Collaborating with High Schools

One of team Aether’s members is yet to be a college student at the university! Kelsey Justis, a sophomore at Mainland High, Daytona Beach, was present during the Engineering Week Event held at Mainland High School on February 18th 2010. During this event, students from the Embry-Riddle Robotics Association and Professor Reinholtz – chair of the Mechanical Engineering Department – presented the various robotic projects sponsored by the University. These projects include the Intelligent Ground Vehicle, the Autonomous Surface Vehicle, Unmanned Aerial Systems, International Aerial Robotics, Autonomous Underwater Vehicle, and the Lunabotics Mining



Professor Reinholtz encourages high school students to get involved in robotics through Engineering Week

Vehicle. Through this outreach activity, the University hopes to generate interest in scientific careers by high-school students.



Kelsey is a sophomore in high school, already engaged in robotics

Kelsey immediately contacted Professor Reinholtz, eager to help develop the Lunabotics vehicle. Previously involved in smaller scale robotic competitions, Kelsey eagerly joined the team to expand his knowledge in robotics at the college level. After quickly introducing Kelsey to the rules of the competition, he has joined every meeting to observe, critique designs, and help assemble components of the robot. This has proved to be an immediate success from the point of view of both outreach and finding a productive team member. Kelsey has already expressed interest in summer classes although he has not yet graduated from high-school!

Continuing outreach...

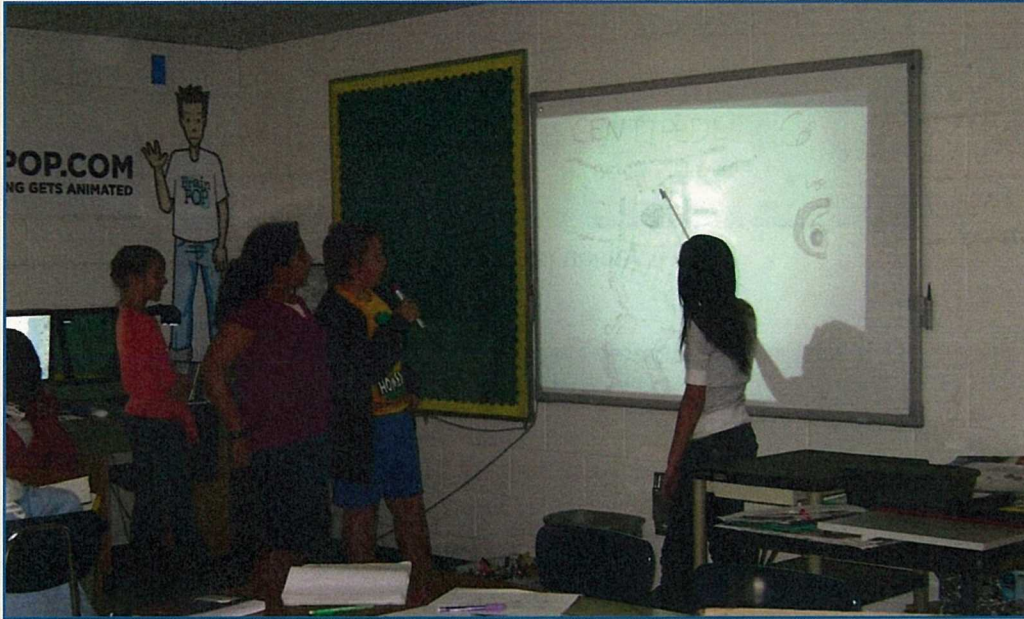
All outreach programs have a common goal: grab the attention of someone and hope to make a difference in their life. Will they suddenly find that spark to understand and enjoy mathematics like never before? Will they pursue that spark and go to college? Will they learn that communicating with others is one of their primary skills?

To keep the door open to that spark of interest, all the outreach partners have been encouraged to attend the upcoming Lunabotics Robotic competition at Kennedy Space Center, on May 25th 2010. Final arrangements are still in progress to fund transportation and other expenses.

We strongly believe that our Lunabotics outreach activities will continue to instill in younger students the love of space, science, and mathematics. There is no greater motivation or reward.

APPENDIX A

Below are additional pictures of the visit to Port Orange Elementary school: scans of some teams' design as well as SkeethUp files. The link <http://gallery.me.com/ibakayaker#101024> presents a video of the teams working on their project, helped by team Aether's members. Another link, <http://gallery.me.com/ibakayaker#101046>, records students presenting their personalized SketchUp drawings.



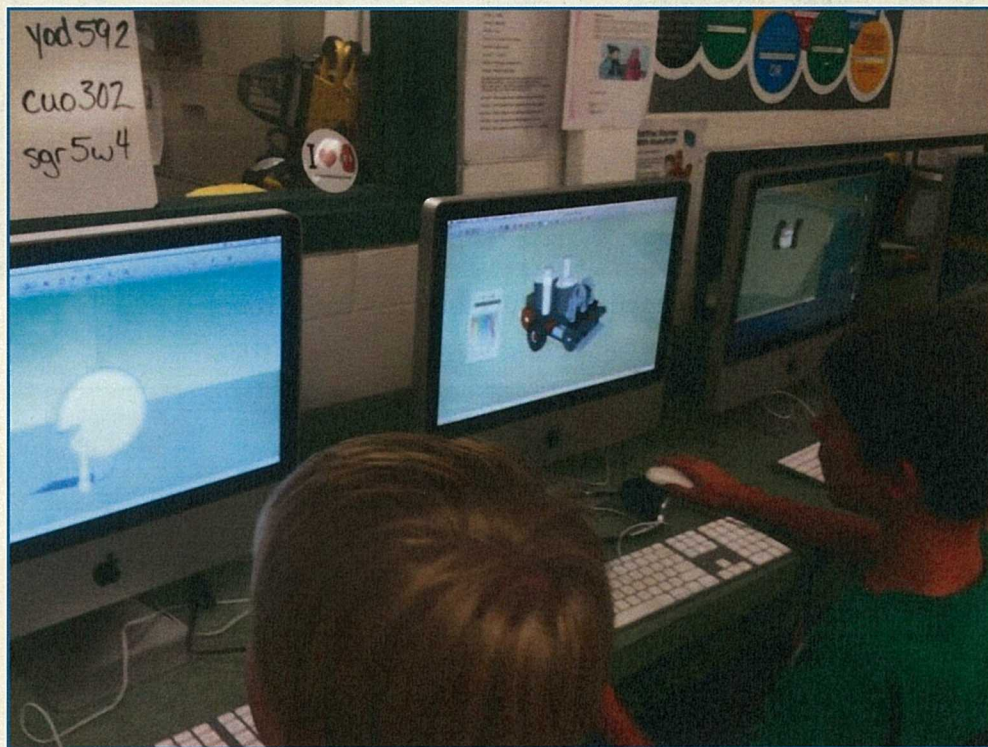
Team Centipede presents their centipede robot



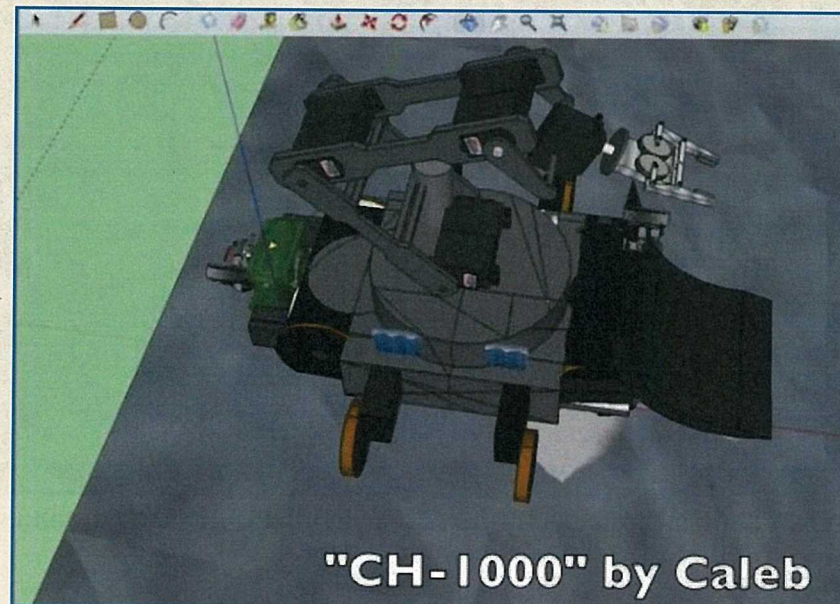
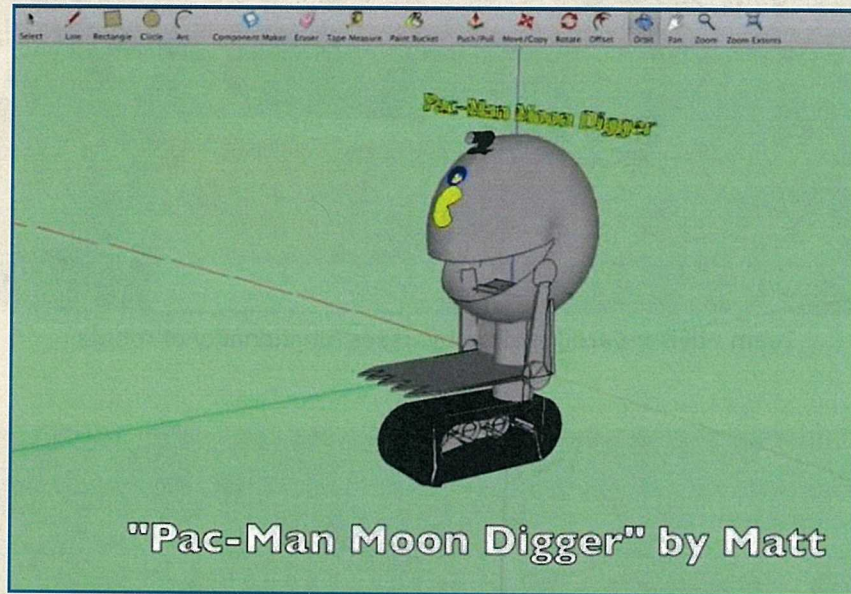
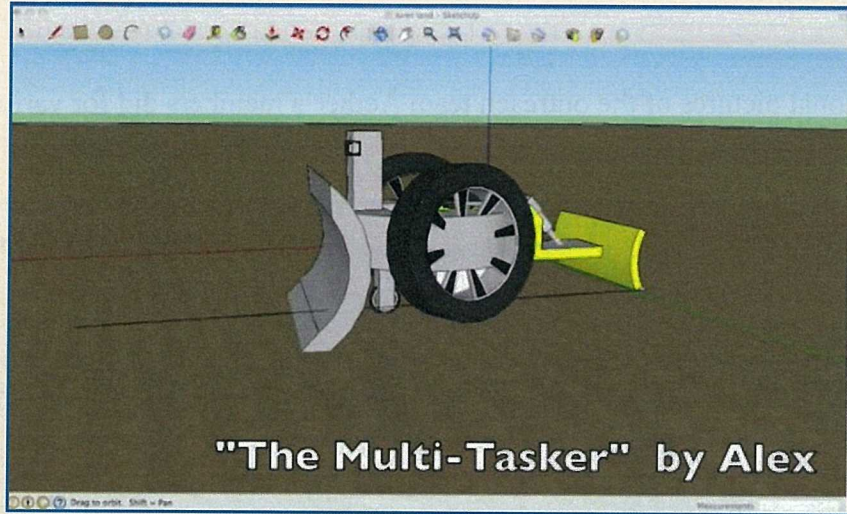
Amanda Pollock mentors one team



Jerosh Jaison presents the winner



Students polish the SketchUp CAD drawing made during Spring Break.
Final results are shown on next page.

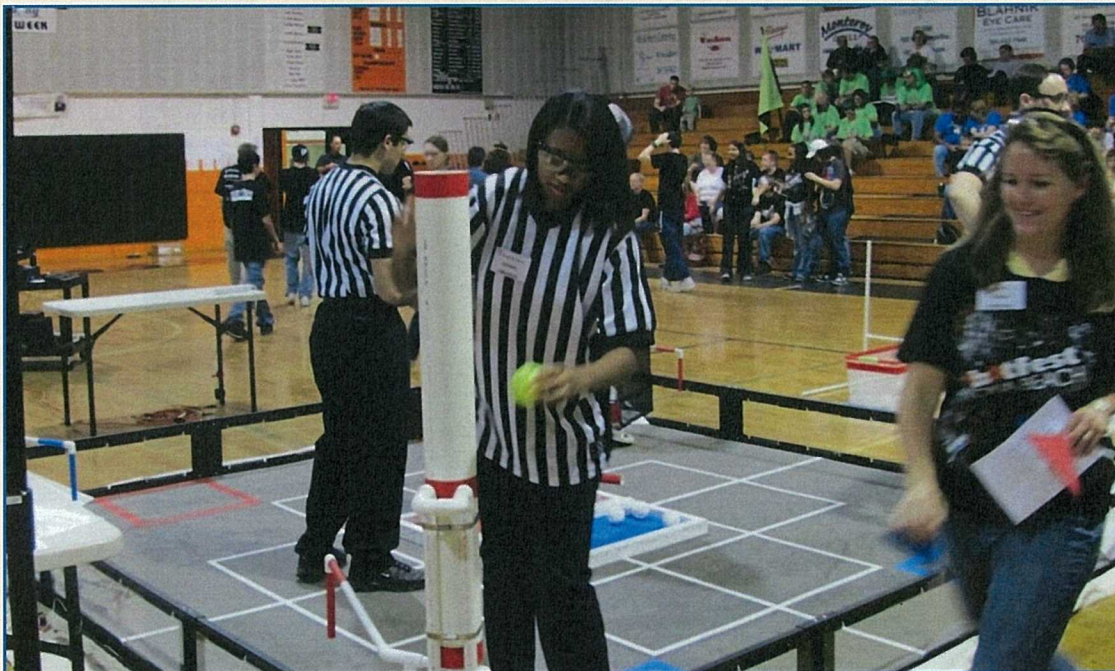


APPENDIX B

Below are additional pictures of the outreach team Aether's members did for various FIRST programs.



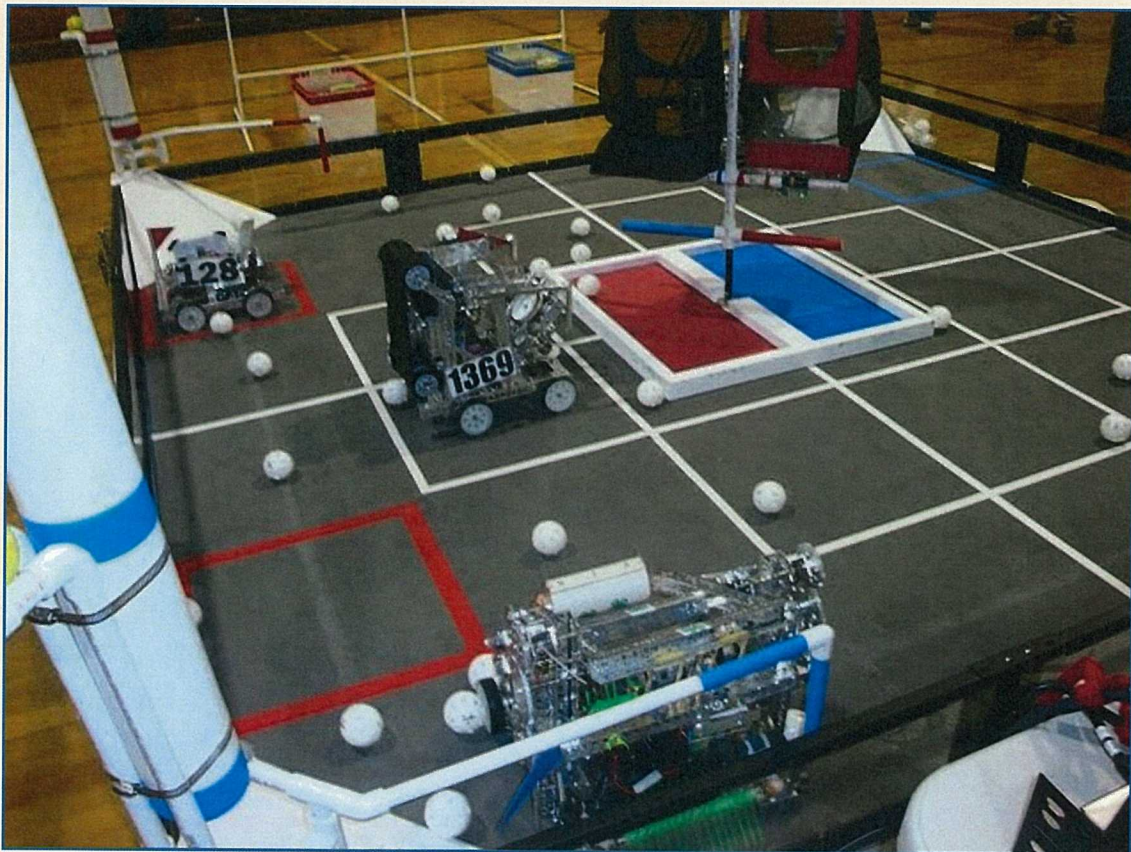
Team Advisor Caroline Liron oversees functionality of robots



Rayna Thompson reloads the tubes conveying the balls to the robots



Team Smoking Bacon entertains the crowd during a technical delay



The playing field for the FIRST Technical Challenge Competition